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## NOTES ON NEW ENGLAND ORCHIDS,— I. SPIRANTHES.

OAKES AMES.

(Plates 127-129)

SPIRANTHES, as limited in the most recent monograph of the Spiranthæ,<sup>1</sup> includes only those species that are characterized by a spiral arrangement of the flowers. Thus limited, the genus attains its highest development in the United States. It is the only large amphigean orchid genus in our flora that has a preponderance of its recognized representatives in the range covered by Gray's New Manual, Small's Flora of the Southeastern United States and floras devoted to the vegetation of our western coast.

Among the twenty-four genera proposed as components of the Spiranthæ, the genus *Spiranthes* is set apart by the spiral arrangement of flowers in which the lateral sepals are free to the base and not decurrent on the ovary and in which the short column is characterized by a bent tip and an abbreviated foot. With the exception of *Spiranthes*, the genera of the Spiranthæ are confined to the New World. Whether or not we can permanently exclude from *Spiranthes* such species as *Spiranthes cranichoides* Cogn. now referred to *Cyclopogon*, and *Spiranthes eriophora* Robins. & Greenm. now referred to *Schiedeella*, is a debatable question.

*Spiranthes* is the most perplexing orchid genus in our flora. It is the least understood and the one that furnishes to authors who grow impatient under the restraints imposed by cautious progress, the best

<sup>1</sup> R. Schlechter in Beihefte zum Bot. Centralbl. XXXVII (1920), Abt. II, 318-454.

opportunities for the multiplication of species. It is a genus that repays intensive observation in the field and prolonged contemplation in the herbarium.

Taken throughout its range *Spiranthes*, as now limited, includes not less than twenty-two species. Of this number twelve are natives of the United States and Canada. Of extra-limital species only one has been reported from the mainland of South America. Three species are found in Europe, one of these, *Spiranthes Romanzoffiana* Cham., being also a native of the northern United States. Several are natives of the vast area included in Asia, Malaya, Australia and New Zealand. As to the validity of some of the Asiatic species, there is a difference of opinion and the final treatment of several of these may result in the recognition of a single polymorphic species with an extraordinarily wide distribution.

In the range covered by Gray's Manual there are three species that frequently present difficulties when a sure diagnosis is attempted. These are *S. cernua* L. C. Rich., *S. odorata* Lindl., and *S. vernalis* Engel. & Gray. *Spiranthes cernua* is so variable that attempts are sometimes made to discover in it a polymorphic species susceptible of splitting. It is difficult, without microscopical examination, to distinguish it from the variety *ochroleuca* Ames. Sometimes it is identified as *S. odorata*. It would seem that *S. odorata* owes its success in escaping synonymy to the fact that it was born under authority and subsequently sustained because efforts to recognize it have persisted. I am convinced that *S. odorata* is conspecific with *S. cernua*.<sup>1</sup>

*Spiranthes cernua* seems to exhibit a surprising range of variation and sometimes attempts are made to segregate new species from it. These result, I believe, from a misunderstanding of the life history of the species. In my opinion, the range of variation exhibited represents different stages of development. The seeds of this species are ripe and ready for dissemination shortly after the flowering period. If the seeds fall in favorable ground and mycorrhizal fungi, presum-

<sup>1</sup> J. K. Small refers *Spiranthes odorata* Lindl., *Gyrostachys ochroleuca* Rydb. and *Gyrostachys constricta* Small to *Ibidium cernuum* (L.) House, *Fl. Southeastern U. S.*, ed. 2 (1913) 320. The use of the generic name *Ibidium* is contrary to the international rules governing botanical nomenclature and should be dropped. It is in the list of *nomina relicienda* and is also excluded by Article 37 of the international rules of botanical nomenclature adopted at Vienna in 1905. There is no sanction for the use of *Ibidium* as a generic name other than that found in obstinate adherence to provincial practice.

ably essential to germination, are present, growth begins in the following season. The protocorm stage is soon reached and by autumn one or more leaves and a slender root have been produced. In the next growing season the little plants, if conditions are favorable, form their first flowers. These are borne in slender few-flowered racemes that represent a stage of development and not a permanent characteristic. The root-system now begins to increase and in the next growing season is sufficiently strong to support an elongated many-flowered raceme. Among the plants that represent any one of these stages of development normal variation may be expected, this depending to a large extent on the favorable or unfavorable influences that have prevailed. If, with these remarks in mind, we regard the *Spiranthes* population of any given area, the apparent variation is at once explained and no longer awakens a feeling of uncertainty as to the specific limitations imposed by conservative opinion.

It should be remembered that most orchids, at least most of those of which we know the stages of development, rarely produce flowers until after the vegetative system has become well established. The genus *Cordula*, for example, a genus allied to our native genus *Cypripedium*, produces strong growths of leaves and roots before the first flower is formed. Under ordinary conditions there is very little variation after the first flower is produced if the plants are under similar and favorable influences. If variations occur they are truly varietal, in a horticultural sense, and, as in the case of *Cordula insignis* var. *Sanderæ*, may be perpetuated by self fertilization. *Spiranthes cernua*, so far as I have observed it, is one of the exceptions to this rule and in each flowering season presents a different habitual and floral aspect until the limit of vigor of the vegetative system is attained. If proof of this is desired it is only necessary to dig up the roots. In young plants these will be found very slender and few in number. In very slender plants with abbreviated few-flowered racemes it is not unusual to find a single root, this representing the first root developed from the protocorm of the preceding year. In vigorous plants with many-flowered racemes the roots will be found stout and numerous and will furnish conclusive evidence of the fact that the plants have attained a development representative of several years' growth. Although I have been unable to study *S. gracilis* from the earliest seedling stages, my observations lead me to believe that it is comparable to *S. cernua* in its development and that the

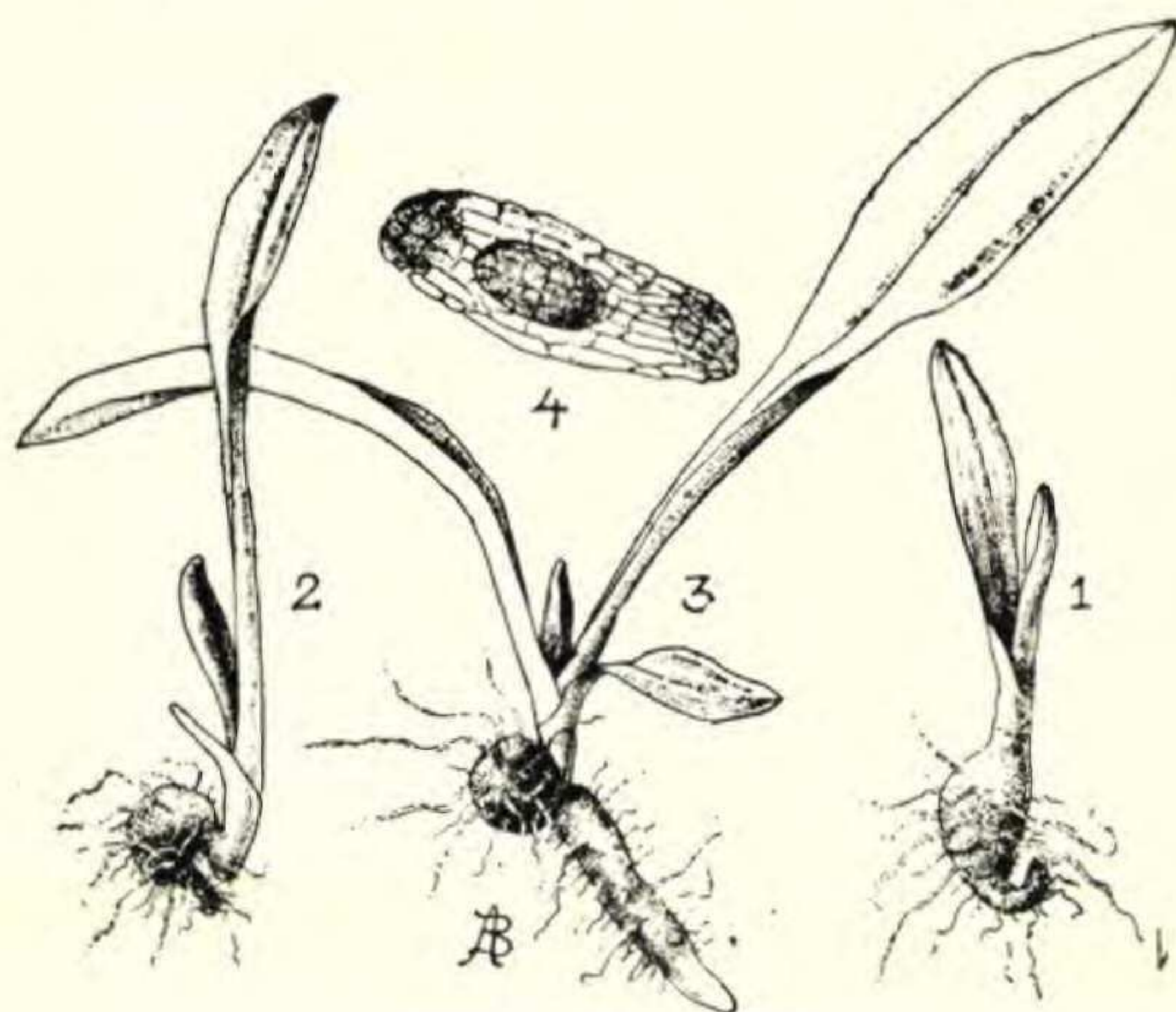
wide range of variation in size is due to the same phenomena that govern in the case of *S. cernua*.

In another paper of this series I shall show that *Pogonia verticillata* (Willd.) Nutt. (*Isotria verticillata* Raf.) in its seedling stages develops, in its first or second season of growth, a very weak root-system and only three leaves, and that this species probably requires a long preparatory period before the plants are strong enough to produce their first flowers. It is on this basis that we may explain the general similarity among the flowering plants of a colony of this *Pogonia* when compared with a colony of *Spiranthes cernua* in which a striking dissimilarity is apparent in floral and vegetative characters. We do not find here a succession of flowers produced during the early stages of development of the plants. Variations, if they occur, must be explained as the result of unusually favorable or unfavorable conditions affecting a plant here and there, or as the breaking down of specific characters, because in this case we are in the presence of a species that attains vegetative maturity before it begins to form its flowers.

The most favorable time to study the seedling stages of *Spiranthes* is in the summer and autumn when the different species are flowering. The reason for this is explained by the tendency of the seeds to germinate near mature plants. It would seem that the mycorrhizal fungus usually associated with *S. cernua* and perhaps essential to its development, is in abundance near established plants and ready to infect fertile seeds. The parent plants also serve as a guide to the places where seedlings may be sought for with success. Careful search will sometimes reveal hundreds of young plants in many stages of early development from the protocorm, devoid of root or leaf, to seedlings with a well developed root and one or more leaves. In an area less than a meter square I have found literally hundreds of seedlings, some of the smallest with the first leaf just forming and the protocorm resting in loose humus surrounded by cobweb-like hairs. In this stage of development sections of the protocorm exhibit a very thrifty condition of the mycorrhizal fungus which fills the cortical cells surrounding the vascular system.

Although it is highly probable that *Spiranthes*, like most of the other orchid genera that have been studied, depends on mycorrhiza for successful development, it is interesting to note that mature plants of *Spiranthes cernua* L. C. Rich., *S. gracilis* Beck, and *S.*

*Beckii* Lindl. are provided with roots that at flowering time are free from mycorrhizal fungi except for a small area at the base of the stem. Cross sections of the roots at any point a few millimeters below the base of the stem will be found simply filled with an abundance of food material. This accounts, perhaps, for the failure of at least one observer to find fungal hyphae in the root of *S. Beckii*.<sup>1</sup> In the study of the roots of *Spiranthes* in connection with mycorrhiza it is best to make longitudinal sections, as cross sections are likely to be inconclusive. From a study of these longitudinal sections it would seem that certain areas of the root have the capacity to repel the advance of the fungus and that in this respect the roots of *Spiranthes* are comparable to the bulbous thickenings of certain species of the *Ophrydeae* studied by Noël Bernard.<sup>2</sup> It is as if there were some



Figs 1-4. Three stages of development in the seedlings of *Spiranthes cernua*. 1. Protocorm and two leaves before the formation of the first root ( $\times 3$ ). 2. A more advanced stage before formation of a root ( $\times 2$ ). 3. A young plant with the protocorm still present and the first root developing ( $\times 1\frac{1}{2}$ ). All as found in September growing within a few inches of each other and apparently seedlings of equal size. 4. Seed of *Spiranthes cernua* var. *ochroleuca* (highly magnified).

fungicidal capacity in the cells of the root-structure that restricts the fungus to a limited area. Or, we may have, in the case of *Spiranthes*, an example of those plants that are able to defend themselves against an intrusive fungus by means of a digestive process that protects tissues of vital importance. In other words, there are two types of cells in the root-system, one type characterized by a capacity to digest the fungus and hold it in check, the other type, found in infected regions, characterized by the capacity to act symbiotically with the invading fungus.

<sup>1</sup> T. Holm, *Am. Journ. Sci.* xviii (1904) 205.

<sup>2</sup> *Annales des Sciences Naturelles Botanique*, xiv (1911) 222-234.

I have referred above to the difficulties experienced in distinguishing *Spiranthes cernua* from the variety *ochroleuca*. Sometimes plants that grow in upland meadows or in woodlands are arbitrarily referred to the variety while the plants of boggy ground are referred to the species. If a more reliable guide to differentiation is asked for we find few collectors who are able to give it. There is only one sure guide that I have found satisfactory, namely, polyembryonic seeds for the species and normal seeds for the variety. This distinction holds good in New England, at least, and may prove generally applicable. Usually a raceme in which the three lowermost flowers have withered furnishes ovules that are in good condition for examination. If the ovules are transferred to a slide, cleared with potassium hydroxide, rubbed under a cover-glass and then gently heated until ebullition begins, the presence or absence of polyembryony may be readily determined by means of the compound microscope. As a rule the seeds of the species are balloon-shaped while the seeds of the variety are slenderly elliptical. A few comparative studies will soon make clear when polyembryony is present. The difference, of course, between the species and the variety is best observed in the contents of mature capsules. As the plate (127) tends to show, there are slight differences between the lips of the species and the variety. The lip of the species is rather oblong, sometimes slightly constricted near the middle; the nectar-glands are usually shorter than in the variety. In the variety the lip is ovate or ovate-oblong in outline with the glands slightly longer and perhaps more curved than in the species. These characters, however, are not always so clearly shown as in the plate and one form of lip may pass by imperceptible degrees into the other. The only reliable distinction is found in the seeds and it would be well worth while to ascertain by cultural experiments whether or not this is due to the nature of the soil in which the plants grow and whether or not it prevails throughout the range of the species. Will the variety, for example, exhibit polyembryony if grown in bogs? Will the species produce normal seeds if transferred to upland woods?

Polyembryony was first demonstrated in *Spiranthes cernua* by Leavitt<sup>1</sup> in 1900, as a result of observations made in my laboratory on specimens collected at North Easton, Mass. At first the occurrence of polyembryony was thought to be local as Curtis<sup>2</sup> had figured

<sup>1</sup> RHODORA, ii (1900) 227.

<sup>2</sup> Bull. Torr. Bot. Club, xx (1893) 188.

normal seeds. Material from other stations (Webster, Mass., and Toronto, Canada) was found to be polyembryonic and subsequent studies seemed to confirm the belief that polyembryony is a reliable guide to the recognition of the wet meadow and bog form of *S. cernua*. Leavitt stated this positively in his paper on the Geographic Distribution of Closely Related Species.<sup>1</sup> In the late summer of 1920 I made careful studies of material collected in Easton and Sharon and confirmed the accuracy of Leavitt's observations. Specimens which grow associated with *Calopogon* and *Arethusa* are polyembryonic without exception according to my observations. The same is true of specimens that grow in what is usually termed sour soil. In dry fields where ericaceous plants are encroaching the polyembryonic form also prevails. In woodlands and rich upland pastures polyembryonic forms are wanting, their place being taken by the form with normal seeds that we now refer to *Spiranthes cernua* var. *ochroleuca*.

*Spiranthes vernalis* Engel. & Gray, as far as the northern forms referred to it are concerned, may be simply a hybrid between *S. cernua* and *S. gracilis*. In September, 1920, I found specimens of a *Spiranthes* which showed unmistakable signs of hybridity. They were almost perfectly intermediate between *S. cernua* and *S. gracilis* with both of which species they were associated in a small run-out field on the shore of Wilbor Pond near the Easton-Sharon line. These hybrids resembled closely some of the more robust forms of so-called *S. vernalis* collected in the neighborhood of South Easton in 1903 and 1904. Only three plants were found. Intensive exploration of the surrounding fields failed to reveal additional specimens. In its proportions the suspected hybrid resembled *S. cernua* very closely but was much taller and more slender. The flowers had the yellowish tinge that is sometimes so characteristic of var. *ochroleuca*. The lateral sepals were wide-spreading as in *S. gracilis* and the flowers were arranged in slender, elongated racemes that seemed to consist of several spirals. The characters of the hybrid are very clearly shown in the accompanying plate (128). Whether or not the southwestern forms of *S. vernalis* originally described by Engelmann and Gray were of hybrid origin and comparable to this northern form is a question for which the answer may be forthcoming as a result of experimental evidence. All of the species that enter into the ques-

<sup>1</sup> American Naturalist, xli (1907) 234.

tion are natives of Texas, where *S. vernalis* was originally collected, and if they inter-cross readily there is no reason to doubt the probability of the type of *S. vernalis* having been of hybrid origin. In the north, at least, it seems to be true that *S. vernalis* is usually found associated with *S. cernua* and *S. gracilis* and is unknown where these species fail. So far as Texas is concerned, however, there is one serious objection to the theory that the original *S. vernalis* was a hybrid and that is the season of anthesis of the supposed parents. In Texas *S. vernalis*, as the name implies, is a vernal species that blooms in April–June. *S. cernua*, from my records, blooms in October in Texas. *S. gracilis* blooms there in spring and autumn. Throughout its range *S. cernua* is an autumn or early winter bloomer. Experimental evidence is much needed in connection with this problem and it would be well worth while to make crosses, between the species that are suspected, during the next flowering season.

*Spiranthes cernua* × *gracilis*. Plant 40–43 cm. tall. Stems wand-like, about 3 mm. in diameter; pale green. Roots stout, up to 6 mm. in diameter, 1 dm. or more long. Leaves 4–6, the lowermost ones withered at flowering time, 3-nerved, obliquely erect, alternate, distichous, linear-lanceolate, 2 dm. long, 8 mm. wide, acute, margin involute. Above the leaves are four or five closely appressed bracts of which the lower ones are tubular and sheathing at base. Racemes densely flowered, 8–13.5 cm. long, 1.7 cm. in diameter. Floral bracts about 6 mm. long, strongly concave, lanceolate, acuminate, exceeding the ovary, margin inconspicuously scarious, tip appressed to the flower. Flowers 7 mm. long, white with yellow lip, at right angles to the rachis. Bracts and rachis pubescent, yellowish green in hue. Stem sparingly pubescent below, densely and shortly so above. Lateral sepals 7 mm. long with the margin strongly inrolled forming a tube at the middle, wide-spreading as in *S. gracilis*, not, as in *S. cernua*, appressed to the lip with the points above its tip and touching the petals, base strongly concave; upper sepal 8 mm. long, closely appressed to the petals. Petals lightly adherent to the upper sepal and equal to it in length, smooth, oblong, obtuse. Labellum about 8 mm. long, sharply decurved above the middle, deeply grooved along the median line beneath and in part covered with microscopically minute spherical emergences, oblong, obtuse, the apical margin lacerate-dentate, disc papillose near the apex. Calli prominent, smooth and glistening above, glandulose on the basal half; claw



broadly cuneate. Gynostemium green, glandular-pubescent on the inner face below the large, broadly ovate, somewhat protuberant stigma, 4 mm. long, the teeth of the rostellum linear-triangular, about 1.5 mm. long. Pollinia as in *S. cernua*, Tetrads characteristically irregular, extine pitted reticulate.

MASSACHUSETTS, Bristol County, at border of blueberry swamp on the side of a sloping grassy knoll in run-out pasture. Three specimens found near Wilbor Pond, North Easton, September 11, 1920, Ames (Herb. no. 17,391).

When collected the flowers on the lower half of the raceme were withered, although *Spiranthes cernua* close at hand had not yet opened any flowers.

The elongated, slender raceme, the wide-spreading lateral sepals, and the form of the labellum seem to indicate that the specimens here described are clearly referable to *S. cernua* × *gracilis*. The base of the lip in the hybrid is more like *S. gracilis* than *S. cernua*. Another bit of weighty evidence is found in the rarity of the plant and its distribution. No other specimens were found although a diligent search was carried on in surrounding fields during the remaining flowering period of our native species of *Spiranthes*.

In my remarks above on *S. vernalis* I have suggested that our New England plant referred to it may simply be a hybrid between *S. cernua* and *S. gracilis*. If this assumption is correct, then it would seem that the hybrid described under the name *Spiranthes* × *intermedia* and recorded as a cross between *S. vernalis* and *S. gracilis* may be one of the variants of a cross between *S. cernua* and *S. gracilis* in which the characters of *S. gracilis* are clearly predominant.

The abundance of fertile seeds produced by our species of *Spiranthes* indicates a high degree of successful pollination. I have suspected that thrips play an important part in pollinating *S. cernua* as my observations have been poorly rewarded when I have attempted to detect other insects actually engaged in visits to the flowers. *Bombus pennsylvanicus* De Geer, with pollinia of *Spiranthes cernua* var. *ochroleuca* attached to it, has come into my possession and undoubtedly other species of the genus *Bombus* visit *Spiranthes* flowers for concealed nectar. Darwin observed humble-bees as visitors to *Spiranthes autumnalis* Rich., and as species of *Bombus* are reported as the pollinating agents of species of the nearly related genus *Goodyera* it is safe to classify this group as characterized by humble-bee

flowers. It is also probable that pollination is effected by nocturnal insects.

In connection with the subject of pollination in *Spiranthes* it is worthy of note that *Spiranthes cernua* forms embryos without pollination.<sup>1</sup>

In Beihefte zum Botanischen Centralblatt XXXVII (1920) Abt. II, 317-454 Rudolf Schlechter published his revision of the *Spirantheæ* in which he made changes among our American species of *Spiranthes*. I shall take up these changes in the alphabetical sequence of the species and make such observations as seem necessary at this time.

1. *Spiranthes Amesiana* Schltr. This species is based on material collected for my herbarium by A. A. Eaton in Florida (no. 921). I distributed this material under the name of *S. tortilis* Rich. Schlechter relies on two characters for the recognition of his species, namely, the conspicuous claw of the lip and glandular hairs on the lip base. He expresses his opinion as follows: "Diese Species ist von Ames als *S. tortilis* Rich. identifiziert und verteilt worden. Tatsächlich ähnelt sie dieser sehr stark, ist aber von ihr sowohl wie von allen übrigen Arten der Verwandtschaft spezifisch recht gut unterschieden durch den auffallenden Lippennagel und die Behaarung am Grunde der Lippenplatte." These characters have broken down absolutely in my attempts to apply them in studies of Eaton's no. 921 and authentic material of *S. tortilis* from Cuba, Jamaica and Porto Rico. As Schlechter referred specimens collected for me by A. E. Wight in the Bahamas to his *S. Amesiana* I studied Wight's collection, but with the same results that I obtained in my studies of duplicates of the type number (Eaton's no. 921). The glandular hairs at the base of the lip on which Schlechter relies in part for specific distinction are found in all of the West Indian specimens referable to *S. tortilis* Rich. that I have examined. Or, to be more explicit, the hairs on the calli, margin and surface of the base of the lip are the same in character and distribution in Eaton's Floridian specimens numbered 921, in Wight's Bahaman specimens referred to by Schlechter and in authentic *S. tortilis* from the West Indies. The claw of the lip is equally conspicuous in all specimens examined and does not, as I observed it, serve as a differentiating character. Differences in size of the flower, variation in the denticulation of

<sup>1</sup> Leavitt in RHODORA, iii (1901) 61.

the front part of the lip and such minor characters are inconsequential as distinguishing marks of a species in *Spiranthes*. Varying lengths of the inflorescence, and different degrees of slenderness or stoutness of the stems are of no diagnostic value in the separation of Floridian and Bahaman plants from specimens of West Indian origin; all extremes being present in any extensive series of specimens from the same locality and readily accounted for by the remarks made above on variation due to age of plants. In my opinion *Spiranthes Amesiana* is conspecific with *S. tortilis*.

2. *Spiranthes ovalis* Lindl. In RHODORA VIII (1906) 6-7, I published the results of my studies of this interesting species which John Lindley described from material gathered in Texas by Drummond. It would seem that Schlechter overlooked this publication in the preparation of his monograph of the *Spirantheæ* as he refers *S. ovalis* to the realm of doubtful species. When I prepared my Synopsis of the Genus *Spiranthes* North of Mexico for the first fascicle of *Orchidaceæ* I was not acquainted with Lindley's type of *Spiranthes ovalis* and I treated it as a doubtful species. Subsequently I examined the type, which is preserved in the Hookerian Herbarium at Kew, and concluded that it is the same as *S. cernua* var. *parviflora* Chapm., *Gyrostachys parviflora* Small and *S. parviflora* Ames (non Lindl.). Schlechter proposes the new name *S. Smallii* for *S. parviflora* Ames.

3. *Spiranthes plantaginea* (Raf.) Torr. Fl. New York II (1843) 284, not Lindl.

*Neottia plantaginea* Raf. in Amer. Month. Mag. II (1818) 206.

*Neottia lucida* H. H. Eaton, Transyl. Journ. Med. 5 (1832) 107.

*Spiranthes cernua* var. *latifolia* Torr. Comp. (1826) 320.

*Spiranthes latifolia* Torr. ex. Lindl. Orch. Pl. (1840) 467.

*Spiranthes aestivalis* Oakes in Thomp. Hist. Vermont (1842) 200, not Rich.

*Gyrostachys latifolia* Kuntze, Rev. Gen. Pl. pt. 2 (1891) 664.

*Gyrostachys plantaginea* Britton and Brown, Ill. Fl. I (1896) 470, fig. 1122, not Kuntze.

*Spiranthes lucida* Ames, *Orchidaceæ* II (1908) 258.

*Ibidium plantagineum* House in Bull. Torr. Bot. Cl. XXXII (1905) 381.

As Schlechter transfers Lindley's *Spiranthes plantaginea* to *Cyclopogon*, Torrey's *S. plantaginea* must be reinstated, and supplants *Spiranthes lucida* in Gray's New Manual.

As Schlechter's treatment of the Spirantheæ necessitates changes in the nomenclature of several American species that are natives of the United States it may be of interest to tabulate them here.

1. *Mesadenus lucayanus* (Britton) Schltr.

*Ibidium lucayanum* Britton.

*Spiranthes lucayana* Cogn. FLORIDA.

2. *Cyclopogon cranichoides* (Grieseb.) Cogn.

*Pelexia cranichoides* Grieseb.

*Spiranthes Storeri* Chapm.

*Beadlea Storeri* Small.

*Sauroglossum cranichoides* Ames. FLORIDA.

3. *Centrogenium setaceum* (Lindl.) Schltr.

*Collea calcarata* Lindl.

*Neottia calcarata* Hook. f.

*Pelexia setacea* Lindl.

(?) *Eltroplectris acuminata* Rafinesque. FLORIDA.

The genus *Stenorrhynchus* is retained in the original conception of that genus. Representatives are found in the southern United States.

#### PLATE 127.

##### SPIRANTHES CERNUA L. C. RICH.

Figs. 1 & 2. General habit, natural size.

Fig. 3. Lateral sepal  $\times 4$ .

Fig. 4. Petal  $\times 4$ .

Fig. 5. Upper sepal  $\times 4$ .

Fig. 6. Labellum  $\times 3$ . Spread out to exhibit outline.

Fig. 7. Column  $\times 8$ . The heart-shaped area represents the stigmatic surface; the disc of the Pollinia is indicated by the shaded area above.

Fig. 8. Pollinia  $\times 10$ .

Fig. 9. Pollen tetrad highly magnified.

Fig. 10. Seed much enlarged, showing polyembryony.

Fig. 11. Section through perianth, column and ovary  $\times 4$ , to show position of anther, Pollinia and honey gland.

##### SPIRANTHES CERNUA VAR. OCHROLEUCA AMES

Fig. 12. General habit, leaves and roots removed, natural size.

Fig. 13. Labellum  $\times 3$ . Spread out to exhibit outline.

#### PLATE 128.

##### SPIRANTHES CERNUA $\times$ GRACILIS.

Fig. 1. General habit, natural size.

Figs. 2 & 3. Flower  $\times 4$ . Showing wide-spreading lateral sepals.

Fig. 4. Labellum  $\times 4$ .

Fig. 5. Column  $\times 4$ .

Fig. 6. Pollen tetrad highly magnified.

Fig. 7. Lateral sepal  $\times 4$ .

Fig. 8. Petal  $\times 4$ .

## PLATE 129.

## SPIRANTHES GRACILIS (BIGEL.) BECK

- Figs. 1 & 2. General habit, natural size.  
 Fig. 3. Flower  $\times 6$ . One lateral sepal removed.  
 Fig. 4. Labellum  $\times 6$ . Spread out to exhibit outline.  
 Fig. 5. Column  $\times 11$ .  
 Fig. 6. Petal  $\times 11$ .  
 Fig. 7. Upper sepal  $\times 11$ .  
 Fig. 8. Labellum and column in natural position  $\times 11$ .  
 Fig. 9. Section through perianth, column and ovary  $\times 8$ .  
 Fig. 10. Lateral sepal  $\times 8$ .  
 Fig. 11. Pollen tetrad highly magnified.  
 Fig. 12. Pollinia, from below (at left), from above (at right).  
 Fig. 13. Seed, highly magnified.

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## SCUTELLARIA EPILOBIIFOLIA.

M. L. FERNALD.

THE common skullcap of gravelly shores from Newfoundland to British Columbia, south into the northern states, which has always passed as *Scutellaria galericulata* L., has the showy corolla 1.5–2.5 cm. long, with whitish or pale tube and throat, the galea and lips deep violet-blue. As contrasted with our plant true *S. galericulata* of Europe has the corolla at most about 1.5 cm. long and of a nearly uniform paler bluish color (at least as indicated by colored plates and descriptions). The European plant, too, is less pubescent or even glabrous and its leaves not so regularly cordate at base as in the American. In 1832 Arthur Hamilton distinguished the American plant as *S. epilobiifolia*,<sup>1</sup> but his species has been very generally reduced to the Old World *S. galericulata*. When, however, the fully mature nutlets of the two plants are examined they show such striking differences that it becomes apparent that Hamilton's species should be recognized. In *S. galericulata*, the European plant, the nutlets are 1.2–1.3 mm. broad and finely and rather sharply muriculate; in the American plant, *S. epilobiifolia*, they are 1.5–2 mm. broad and coarsely pebbled or almost warty. This difference in the nutlets seems to be constant in all the mature specimens examined and no *S. galericulata* has been detected in the large mass of American specimens. Our plant is, then,

<sup>1</sup> A. Hamilton, Esquisse d'une Monographie du Genre *Scutellaria*, 32 (1832).